

**HALLIBURTON**

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**Sperry Drilling**

**END OF WELL REPORT**

*For*

**Anadarko Petroleum Corp.**

*Drilling 27C-32HZ*

*Sec. 32-T2N-R65W*

*Weld County, CO*

*Job #900901380*

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# SPERRY-SUN DRILLING SERVICES

## CERTIFIED SURVEY WORK SHEET

OPERATOR:	Anadarko Petroleum Corp
WELL:	Drilling 27C-32HZ
FIELD:	Wattenberg
RIG:	Ensign 132
LEGALS:	Sec 32-T2N-R65W
COUNTY:	Weld
STATE:	Colorado
CAL. METHOD:	Minimum Curvature
MAG. DECL. APPLIED:	8.5
VERTICAL SEC. DIR. :	0.000

SSDS Job Number :	900901380
Start Date of Job :	21-Jan-14
End Date of Job :	28-Jan-10
Lead Directional Driller:	Dan Dietrich
Other SSDS DD's :	Omar Dominguez
	Levi George
SSDS MWD Engineers :	Matt Busche
	Rueben Edlington
	Matt Henderson

Main Hole	1st Side Track	2nd Side Track	3rd Side Track	4th Side Track
	Tie On	Tie On	Tie On	Tie On
948.00	Gyro			
1097.00	MWD			
6778.00	KOP	KOP-ST1	KOP-ST2	KOP-ST3
11831.00	MWD			
11876.00	Projection			
		T.D.	T.D.	T.D.

The following personnel listed below, certify the above survey information to be accurate to the their knowledge. :

Print Name : Dan Dietrich	Print Name : Omar Dominguez
Sign Name : 	Sign Name : 
Print Name : Matt Busche	Print Name : Rueben Edlington
Sign Name : 	Sign Name : 

Examples of  
Survey Types:

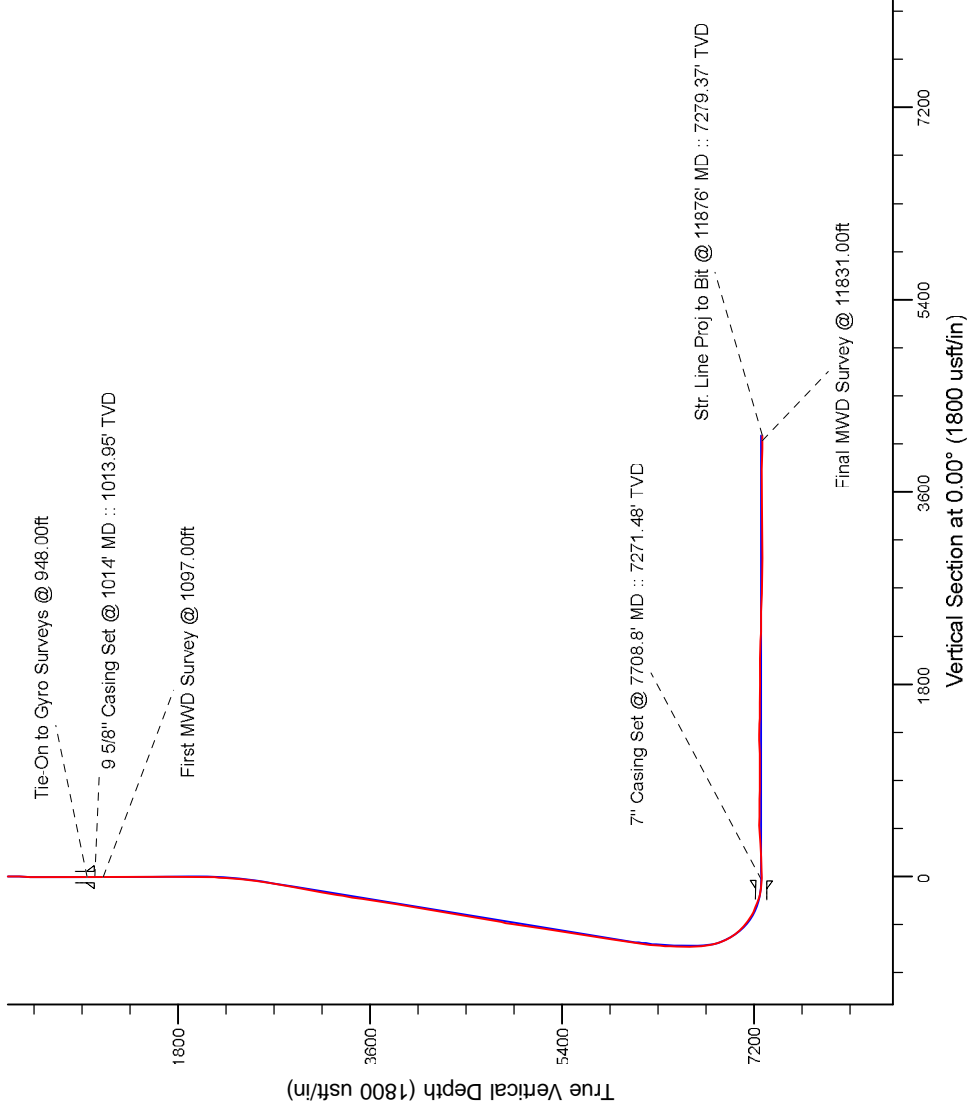
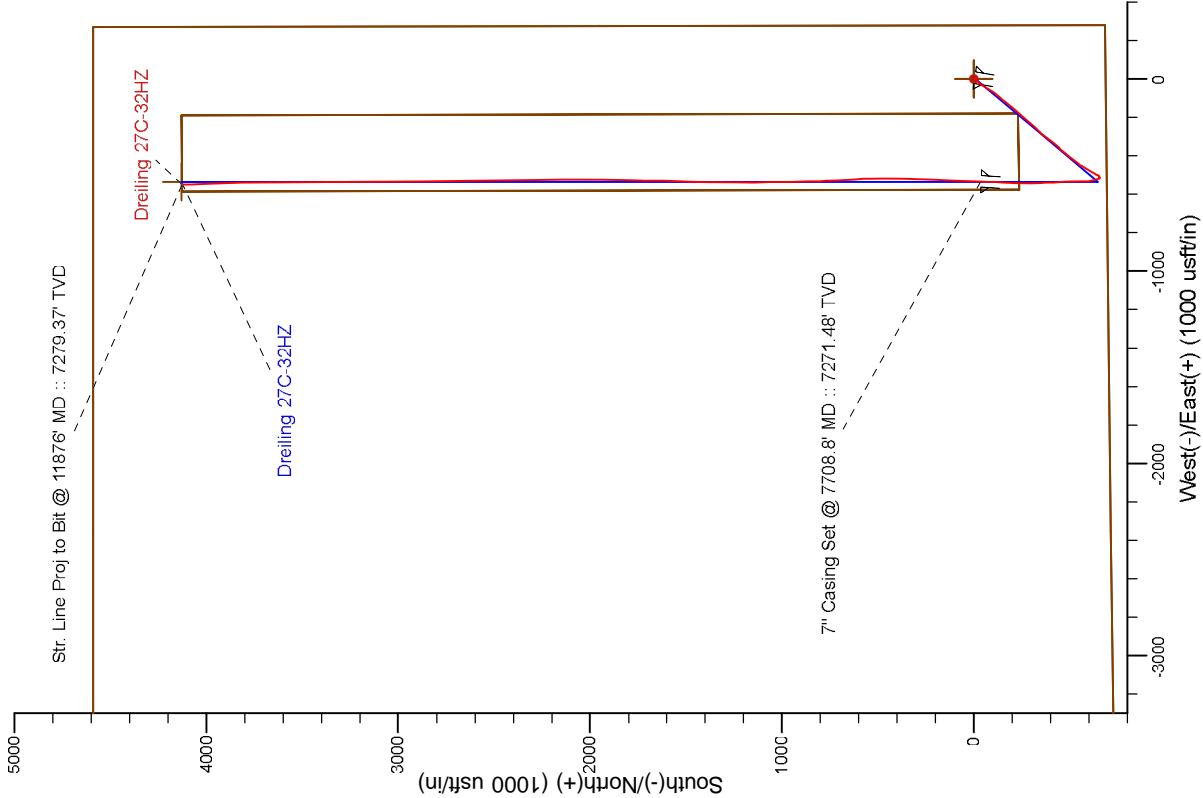
Tie On  
MWD  
ESS  
Gyro  
SS

Tie On to Surface Casing (Assumed Vertical), Tie On to existing MWD Survey (prior drilled hole)  
Sperry Sun Drilling Services (SSDS) Measurement While Drilling (MWD) Survey's  
Sperry Sun Drilling Services (SSDS) Electronic Survey System (ESS) Survey's  
Gyro Survey's ; Provided by third party vendor, or by Sperry Sun Drilling Services (SSDS)  
Single Shot (SS) Survey's ; Provided by Sperry Sun Drilling Services (SSDS) or third party vendor.

Project: Weld County, CO (NAD 83)  
Site: Sec. 32-T2N-R65W  
Well: Drilling 27C-32HZ  
Wellbore: Plan B  
Design: Actual Field Surveys

LEGEND

- Drilling 27C-32HZ, Plan B, Rev B1 V0
- Actual Field Surveys



7" Casing: ~655.74' FSL, ~813.22' FEL  
Lat/Long: 40 08.9532 N, -104.681187 E  
State Planes - CO Northern: 1,276,518.82' N, 3,229,089.04' E  
Location: Sec. 32-T2N-R65W

BHL: ~462.04' FNL, ~819.99' FEL  
Lat/Long: 40 10.065 N, -104.681246 E  
State Planes - CO Northern: 1,280,683.17' N, 3,229,034.05' E  
Location: Sec. 32-T2N-R65W

WELL DETAILS: Drilling 27C-32HZ
Ground Level: 4924.00
RKB = 13' @ 4937.00usft (Ensign 132)
Design: Actual Field Surveys (Drilling 27C-32HZ/Plan B)
Created By: Clint Eshelman
Reviewed: Date: 2/4/2013

# Anadarko Petroleum Corp.

Weld County, CO (NAD 83)

Sec. 32-T2N-R65W

Dreiling 27C-32HZ

## Plan B

Design: Actual Field Surveys

## Sperry Drilling Services

## Standard Report

04 February, 2014

Well Coordinates: 1,276,561.29 N, 3,229,621.61 E (40° 05' 22.69" N, 104° 40' 45.42" W)

Ground Level: 4,924.00 usft

Local Coordinate Origin:

Viewing Datum:

TVDs to System:

North Reference:

Unit System:

Geodetic Scale Factor Applied

Version: 5000.1 Build: 70

Centered on Well Dreiling 27C-32HZ

RKB = 13' @ 4937.00usft (Ensign 132)

N

True

Dec-Deg - API - US Survey Feet - Custom

**HALLIBURTON**

**Design Report for Dreiling 27C-32HZ - Actual Field Surveys**

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13.00	0.00	0.00	13.00	0.00	0.00	0.00	0.00
113.00	0.53	192.19	113.00	-0.45	-0.10	-0.45	0.53
213.00	0.63	165.65	212.99	-1.44	-0.06	-1.44	0.28
313.00	0.51	148.02	312.99	-2.35	0.31	-2.35	0.21
413.00	0.72	120.08	412.98	-3.04	1.09	-3.04	0.36
513.00	0.81	103.54	512.97	-3.52	2.32	-3.52	0.24
613.00	0.70	108.89	612.97	-3.88	3.59	-3.88	0.13
713.00	0.64	115.38	712.96	-4.32	4.67	-4.32	0.10
813.00	0.44	93.46	812.95	-4.58	5.56	-4.58	0.28
913.00	0.52	71.70	912.95	-4.46	6.37	-4.46	0.20
948.00	0.33	23.84	947.95	-4.32	6.56	-4.32	1.10
<b>Tie-On to Gyro Surveys @ 948.00ft</b>							
1,014.00	0.21	8.64	1,013.95	-4.03	6.66	-4.03	0.21
<b>9 5/8" Casing Set @ 1014' MD :: 1013.95' TVD</b>							
1,097.00	0.13	311.79	1,096.95	-3.82	6.61	-3.82	0.21
<b>First MWD Survey @ 1097.00ft</b>							
1,192.00	0.13	115.48	1,191.95	-3.79	6.63	-3.79	0.27
1,287.00	0.06	120.67	1,286.95	-3.86	6.77	-3.86	0.07
1,381.00	0.22	41.48	1,380.95	-3.75	6.93	-3.75	0.23
1,478.00	0.28	21.08	1,477.95	-3.39	7.14	-3.39	0.11
1,572.00	0.03	214.45	1,571.95	-3.20	7.21	-3.20	0.33
1,667.00	0.15	333.04	1,666.95	-3.11	7.14	-3.11	0.18
1,761.00	0.03	244.71	1,760.95	-3.01	7.06	-3.01	0.16
1,855.00	0.06	182.14	1,854.95	-3.07	7.04	-3.07	0.06
2,043.00	1.91	240.78	2,042.91	-4.70	4.30	-4.70	1.00
2,138.00	3.47	231.63	2,137.80	-7.25	0.66	-7.25	1.70
2,231.00	5.20	225.66	2,230.54	-11.95	-4.56	-11.95	1.92
2,325.00	6.93	228.47	2,324.01	-18.68	-11.85	-18.68	1.87
2,419.00	7.86	225.16	2,417.22	-26.98	-20.66	-26.98	1.09
2,513.00	9.08	216.35	2,510.20	-37.48	-29.61	-37.48	1.89
2,607.00	9.81	206.74	2,602.93	-50.61	-37.61	-50.61	1.85
2,702.00	11.30	212.29	2,696.32	-65.71	-46.22	-65.71	1.90
2,796.00	12.11	213.09	2,788.37	-81.75	-56.53	-81.75	0.88
2,890.00	12.46	215.60	2,880.22	-98.26	-67.81	-98.26	0.68
2,985.00	12.10	215.75	2,973.04	-114.67	-79.60	-114.67	0.38
3,079.00	13.19	217.70	3,064.76	-131.15	-91.91	-131.15	1.25
3,174.00	12.59	218.83	3,157.37	-147.80	-105.03	-147.80	0.69
3,268.00	12.17	219.88	3,249.18	-163.38	-117.81	-163.38	0.51
3,362.00	13.30	218.66	3,340.87	-179.43	-130.92	-179.43	1.24
3,457.00	12.52	219.88	3,433.47	-195.86	-144.35	-195.86	0.87
3,552.00	10.99	219.26	3,526.47	-210.78	-156.68	-210.78	1.62
3,647.00	12.37	220.73	3,619.50	-225.50	-169.05	-225.50	1.49
3,742.00	11.53	220.26	3,712.44	-240.46	-181.83	-240.46	0.89
3,837.00	12.06	224.51	3,805.44	-254.78	-194.92	-254.78	1.07
3,932.00	12.32	222.91	3,898.30	-269.28	-208.78	-269.28	0.45
4,028.00	11.83	224.28	3,992.17	-283.83	-222.62	-283.83	0.59
4,123.00	12.91	220.54	4,084.97	-298.86	-236.32	-298.86	1.41
4,218.00	13.51	220.95	4,177.45	-315.31	-250.49	-315.31	0.64
4,313.00	13.01	221.90	4,269.92	-331.65	-264.90	-331.65	0.57

**Design Report for Dreiling 27C-32HZ - Actual Field Surveys**

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
4,408.00	12.10	222.55	4,362.65	-346.95	-278.78	-346.95	0.97
4,503.00	13.15	218.66	4,455.35	-362.72	-292.26	-362.72	1.42
4,598.00	12.85	217.42	4,547.92	-379.55	-305.43	-379.55	0.43
4,694.00	12.35	218.63	4,641.60	-396.05	-318.33	-396.05	0.59
4,789.00	12.52	220.55	4,734.37	-411.81	-331.36	-411.81	0.47
4,884.00	12.37	220.55	4,827.14	-427.36	-344.67	-427.36	0.16
4,979.00	11.09	222.46	4,920.16	-441.84	-357.46	-441.84	1.41
5,074.00	10.42	223.98	5,013.49	-454.76	-369.59	-454.76	0.77
5,169.00	11.88	218.17	5,106.70	-468.63	-381.60	-468.63	1.94
5,264.00	11.12	218.94	5,199.79	-483.44	-393.40	-483.44	0.82
5,359.00	10.55	220.00	5,293.09	-497.23	-404.75	-497.23	0.64
5,454.00	11.34	217.62	5,386.37	-511.29	-416.04	-511.29	0.96
5,644.00	11.43	217.09	5,572.63	-541.10	-438.80	-541.10	0.07
5,738.00	9.22	213.89	5,665.10	-554.79	-448.62	-554.79	2.43
5,833.00	10.41	212.26	5,758.71	-568.36	-457.44	-568.36	1.29
5,928.00	10.83	211.91	5,852.08	-583.20	-466.74	-583.20	0.45
6,023.00	10.55	208.26	5,945.43	-598.43	-475.58	-598.43	0.77
6,118.00	10.87	209.31	6,038.78	-613.91	-484.08	-613.91	0.39
6,213.00	9.10	209.24	6,132.33	-628.27	-492.13	-628.27	1.86
6,307.00	7.23	207.36	6,225.38	-640.01	-498.48	-640.01	2.01
6,402.00	5.09	219.05	6,319.83	-648.60	-503.89	-648.60	2.60
6,497.00	3.64	237.48	6,414.55	-653.49	-509.08	-653.49	2.11
6,592.00	2.21	262.46	6,509.43	-655.35	-513.44	-655.35	1.98
6,687.00	1.63	284.45	6,604.38	-655.26	-516.57	-655.26	0.98
6,782.00	2.73	325.71	6,699.31	-653.05	-519.15	-653.05	1.95
6,830.00	8.93	343.87	6,747.05	-648.52	-520.83	-648.52	13.32
6,877.00	14.07	342.76	6,793.09	-639.56	-523.54	-639.56	10.95
6,925.00	16.36	346.89	6,839.40	-627.40	-526.80	-627.40	5.28
6,972.00	19.84	352.03	6,884.07	-613.05	-529.41	-613.05	8.14
7,020.00	23.82	355.79	6,928.62	-595.31	-531.25	-595.31	8.78
7,067.00	30.51	358.33	6,970.42	-573.89	-532.30	-573.89	14.44
7,115.00	36.60	0.13	7,010.40	-547.37	-532.62	-547.37	12.85
7,162.00	40.09	358.92	7,047.26	-518.22	-532.88	-518.22	7.60
7,210.00	44.79	357.03	7,082.67	-485.87	-534.04	-485.87	10.14
7,257.00	48.01	356.58	7,115.08	-451.89	-535.94	-451.89	6.89
7,305.00	51.57	356.70	7,146.06	-415.30	-538.09	-415.30	7.42
7,353.00	59.57	357.25	7,173.18	-375.79	-540.17	-375.79	16.69
7,401.00	64.49	359.37	7,195.69	-333.44	-541.40	-333.44	10.97
7,448.00	68.11	0.24	7,214.58	-290.41	-541.54	-290.41	7.89
7,496.00	71.33	0.85	7,231.21	-245.39	-541.11	-245.39	6.81
7,543.00	73.72	1.45	7,245.32	-200.57	-540.21	-200.57	5.23
7,591.00	77.07	3.12	7,257.43	-154.17	-538.36	-154.17	7.75
7,638.00	81.99	2.54	7,265.97	-108.02	-536.08	-108.02	10.54
7,670.00	85.74	2.62	7,269.38	-76.24	-534.64	-76.24	11.72
7,708.80	88.06	2.35	7,271.48	-37.54	-532.96	-37.54	6.03
<b>7" Casing Set @ 7708.8' MD :: 7271.48' TVD</b>							
7,755.00	90.83	2.04	7,271.93	8.62	-531.19	8.62	6.03
7,850.00	92.47	2.78	7,269.19	103.49	-527.20	103.49	1.89
7,945.00	93.83	1.71	7,263.97	198.27	-523.48	198.27	1.82
8,050.00	92.44	1.94	7,258.23	303.06	-520.14	303.06	1.34
8,135.00	91.82	1.62	7,255.07	387.96	-517.51	387.96	0.82



**Design Report for Dreiling 27C-32HZ - Actual Field Surveys**

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
8,230.00	91.57	358.98	7,252.26	482.91	-517.01	482.91	2.79
8,326.00	90.09	357.72	7,250.87	578.85	-519.77	578.85	2.02
8,421.00	90.03	355.65	7,250.77	673.69	-525.27	673.69	2.18
8,516.00	87.29	357.92	7,252.99	768.50	-530.59	768.50	3.74
8,611.00	90.00	358.94	7,255.24	863.43	-533.19	863.43	3.05
8,706.00	90.77	359.00	7,254.60	958.41	-534.90	958.41	0.81
8,801.00	90.65	359.33	7,253.42	1,053.39	-536.29	1,053.39	0.37
8,896.00	90.46	359.62	7,252.50	1,148.38	-537.16	1,148.38	0.36
9,023.00	91.17	0.07	7,250.70	1,275.37	-537.50	1,275.37	0.66
9,087.00	90.34	359.39	7,249.85	1,339.36	-537.80	1,339.36	1.68
9,182.00	87.69	1.63	7,251.49	1,434.33	-536.96	1,434.33	3.65
9,277.00	89.29	2.23	7,253.99	1,529.24	-533.76	1,529.24	1.80
9,372.00	88.86	1.34	7,255.52	1,624.18	-530.80	1,624.18	1.04
9,467.00	88.80	1.18	7,257.46	1,719.13	-528.71	1,719.13	0.18
9,562.00	90.71	1.66	7,257.87	1,814.10	-526.36	1,814.10	2.07
9,657.00	90.25	1.33	7,257.07	1,909.06	-523.88	1,909.06	0.60
9,753.00	89.29	359.92	7,257.46	2,005.05	-522.83	2,005.05	1.78
9,848.00	88.61	359.57	7,259.20	2,100.04	-523.25	2,100.04	0.81
9,943.00	88.00	358.95	7,262.01	2,194.99	-524.48	2,194.99	0.92
10,038.00	87.87	359.13	7,265.43	2,289.91	-526.07	2,289.91	0.23
10,134.00	89.17	359.31	7,267.91	2,385.87	-527.38	2,385.87	1.37
10,229.00	88.98	359.54	7,269.45	2,480.85	-528.33	2,480.85	0.31
10,324.00	87.22	359.25	7,272.59	2,575.79	-529.33	2,575.79	1.88
10,419.00	87.99	359.36	7,276.56	2,670.70	-530.48	2,670.70	0.82
10,514.00	89.60	359.72	7,278.56	2,765.67	-531.25	2,765.67	1.74
10,609.00	89.88	0.03	7,278.99	2,860.67	-531.45	2,860.67	0.44
10,704.00	91.14	359.57	7,278.15	2,955.66	-531.78	2,955.66	1.41
10,799.00	90.46	359.04	7,276.82	3,050.65	-532.94	3,050.65	0.91
10,894.00	90.06	359.03	7,276.39	3,145.63	-534.54	3,145.63	0.42
10,989.00	88.80	359.82	7,277.34	3,240.62	-535.49	3,240.62	1.57
11,084.00	89.81	359.93	7,278.49	3,335.61	-535.70	3,335.61	1.07
11,180.00	91.08	0.19	7,277.74	3,431.61	-535.60	3,431.61	1.35
11,275.00	92.44	358.94	7,274.82	3,526.55	-536.32	3,526.55	1.94
11,370.00	89.97	359.85	7,272.83	3,621.52	-537.32	3,621.52	2.77
11,465.00	89.08	359.11	7,273.61	3,716.51	-538.18	3,716.51	1.22
11,560.00	89.51	358.87	7,274.78	3,811.49	-539.86	3,811.49	0.52
11,656.00	88.92	358.00	7,276.10	3,907.44	-542.48	3,907.44	1.09
11,751.00	88.83	358.19	7,277.96	4,002.37	-545.64	4,002.37	0.22
11,831.00	89.60	358.31	7,279.06	4,082.33	-548.08	4,082.33	0.97
<b>Final MWD Survey @ 11831.00ft</b>							
11,876.00	89.60	358.31	7,279.37	4,127.31	-549.41	4,127.31	0.00
<b>Str. Line Proj to Bit @ 11876' MD :: 7279.37' TVD</b>							

**Design Annotations**

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
948.00	947.95	-4.32	6.56	Tie-On to Gyro Surveys @ 948.00ft
1,097.00	1,096.95	-3.82	6.61	First MWD Survey @ 1097.00ft
11,831.00	7,279.06	4,082.33	-548.08	Final MWD Survey @ 11831.00ft
11,876.00	7,279.37	4,127.31	-549.41	Str. Line Proj to Bit @ 11876' MD :: 7279.37' TVD

## Design Report for Dreiling 27C-32HZ - Actual Field Surveys

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin +N/_S (usft)	Origin +E/-W (usft)	Start TVD (usft)
User	No Target (Freehand)	0.00	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
13.00	948.00	MS Energy Surveys	NS-GYRO-MS
1,097.00	7,755.00	MWD Vertical/Build Surveys	MWD+IFR1+SC
7,850.00	11,831.00	MWD Lateral Surveys	MWD+IFR1+SC

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
1,014.00	1,013.95	9 5/8" Casing Set @ 1014' MD :: 1013.95' TVD	9-5/8	13-1/2
7,708.80	7,271.48	7" Casing Set @ 7708.8' MD :: 7271.48' TVD	7	8-3/4

Wellbore Targets

Target Name - hit/miss target - Shape	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
Dreiling 27C-32HZ_SE - actual wellpath hits target center - Polygon	0.00	0.00	0.00	0.00	0.00	1,276,561.29	3,229,621.61	40.089635	-104.679282
Point 1				0.00	4,590.37	-4,995.78	1,281,105.05	3,224,583.76	
Point 2				0.00	4,589.75	-2,363.22	1,281,128.79	3,227,216.11	
Point 3				0.00	4,589.19	269.53	1,281,152.60	3,229,848.65	
Point 4				0.00	1,952.63	275.68	1,278,516.31	3,229,879.20	
Point 5				0.00	-683.75	281.78	1,275,880.20	3,229,909.70	
Point 6				0.00	-714.76	-2,351.14	1,275,824.83	3,227,277.28	
Point 7				0.00	-747.76	-4,985.18	1,275,767.45	3,224,643.76	
Point 8				0.00	1,909.05	-4,990.70	1,278,424.00	3,224,613.65	
Dreiling 27C-32HZ_LD - actual wellpath hits target center - Polygon	0.00	0.00	0.00	0.00	0.00	1,276,561.29	3,229,621.61	40.089635	-104.679282
Point 1				0.00	4,126.47	-585.47	1,280,682.00	3,228,998.00	
Point 2				0.00	4,129.27	-189.41	1,280,688.47	3,229,394.00	
Point 3				0.00	-229.13	-179.29	1,276,330.52	3,229,444.46	
Point 4				0.00	-236.98	-575.85	1,276,319.00	3,229,048.00	
Dreiling 27C-32HZ_SH - actual wellpath hits target center - Point	0.00	0.00	0.00	0.00	0.00	1,276,561.29	3,229,621.61	40.089635	-104.679282
Dreiling 27C-32HZ_BH - actual wellpath misses target center by 18.76usft at 11876.00usft MD (7279.37 TVD, 4127.31 N, -549.41 E) - Point	0.00	0.00	7,267.00	4,129.26	-535.44	1,280,685.26	3,229,048.00	40.100970	-104.681196

Directional Difficulty Index

Average Dogleg over Survey:	1.74 °/100usft	Maximum Dogleg over Survey:	16.69 °/100usft at 7,353.00 usft
Net Tortousity applicable to Plans:	0.74 °/100usft	Directional Difficulty Index:	6.278

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Design Report for Dreiling 27C-32HZ - Actual Field Surveys

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Audit Info

**North Reference Sheet for Sec. 32-T2N-R65W - Dreiling 27C-32HZ - Plan B**

All data is in US Feet unless otherwise stated. Directions and Coordinates are relative to True North Reference.

Vertical Depths are relative to RKB = 13' @ 4937.00usft (Ensign 132). Northing and Easting are relative to Dreiling 27C-32HZ

Coordinate System is US State Plane 1983, Colorado Northern Zone using datum North American Datum 1983, ellipsoid GRS 1980

Projection method is Lambert Conformal Conic (2 parallel)

Central Meridian is -105.500000°, Longitude Origin:0.000000°, Latitude Origin:40.783333°

False Easting: 3,000,000.00usft, False Northing: 1,000,000.00usft, Scale Reduction: 0.99996078

Grid Coordinates of Well: 1,276,561.29 usft N, 3,229,621.61 usft E

Geographical Coordinates of Well: 40° 05' 22.69" N, 104° 40' 45.42" W

Grid Convergence at Surface is: 0.53°

Based upon Minimum Curvature type calculations, at a Measured Depth of 11,876.00usft  
the Bottom Hole Displacement is 4,163.71usft in the Direction of 352.42° ( True).

Magnetic Convergence at surface is: -7.97° (25 November 2013, , BGGM2013)

